# CHAPTER 5
OPERATIONAL PROCEDURES



# 5 Operational Procedures

The FAA continually enhances the procedures governing the operation of aircraft in the NAS. Procedural changes are implemented to increase airspace capacity, take advantage of improved aircraft and avionics performance, maximize the use of a new runway, or simply to make the existing air traffic management system work more efficiently.

Although less expensive and time-consuming than other capacity-enhancing solutions, such as building new runways, the development and implementation of new procedures is a complex process. The collaboration of the air traffic controllers and pilots who will be using the procedures is essential. In addition, both controllers and pilots must receive appropriate training before new procedures can be implemented.

Recent FAA actions to develop new operational procedures are discussed in this chapter. These procedures result in more efficient operations in the en route, arrival and departure, and approach phases of flight (Figure 5-1), and ultimately give pilots more flexibility in determining their route, altitude, speed, departure and landing times.

**Figure 5-1** Operating Environments Benefited by Procedural Enhancements

| | Operating Environment | | |
|---|---|---|---|
| Procedural Enhancements | En Route | Arrival and Departure | Approach |
| Spring/Summer 2002 | • | • | |
| RNAV Procedures | • | • | • |
| Reduced Separation Minima | • | | |
| Civilian Access to SUA | • | • | |
| Approaches to Closely Spaced Parallel Runways | | | • |

## 5.1 Spring/Summer 2002

Because intersecting airways interconnect the NAS, a weather delay in one part of the nation's airspace can have a ripple effect, spreading delays across the country. For the past three years, the FAA and the airlines have collaborated in developing new operational procedures, aided by information technology, to improve traffic flow during the severe weather events that are typical in the spring and summer. The collaborative effort, referred to as the Spring/Summer plan, began in 2000, and the approaches to maintaining smooth operations during severe weather have been gradually improved over the years. Key elements of the Spring/Summer 2002 plan are described in the section below.

### 5.1.1 Strategic Planning

The strategic planning team at the Command Center conducts conference calls with major air traffic facilities and representatives from the user community, every 2 hours, 24 hours a day, 7 days a week to discuss the status of the system and constraint projections, and to develop the strategic plan of operations. The strategic plan of operations is a collaborative agreement on how to deal with severe weather and other system constraints, and ensure a degree of predictability for all stakeholders by looking ahead 2 to 6 hours and providing a common view of system issues. The resulting strategic plan is posted on the Command Center web site and sent via advisory to air traffic facilities and the user community.

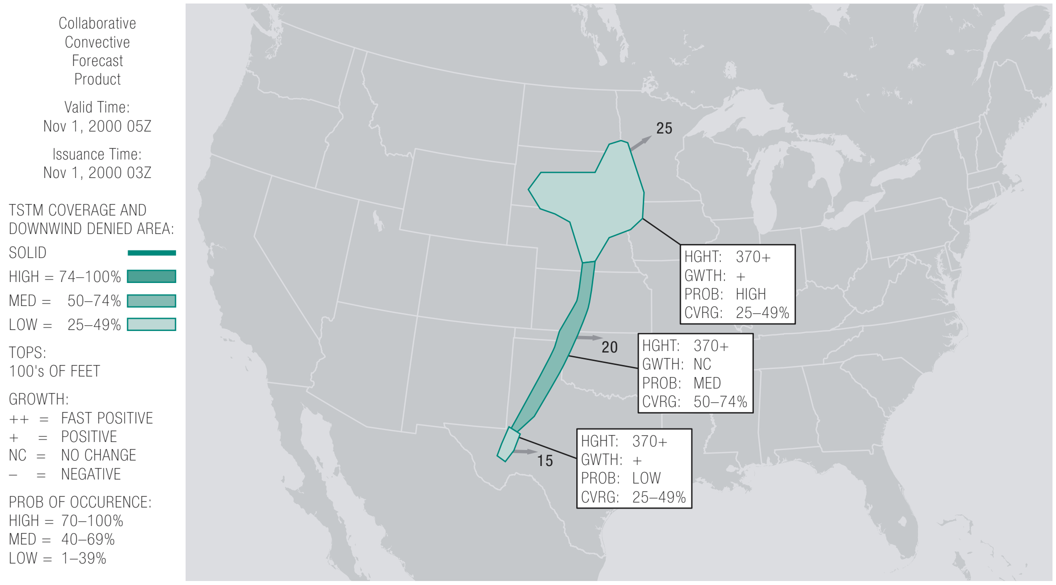
Since its inception, the number of conference calls has increased to cover a larger portion of the day (originally 7 am to 9 pm EST). The improved use of weather information, route coordination, and collaborative decision-making, described below, all contribute to more effective strategic planning and efficient traffic flow.

### 5.1.2 Improved Use of Weather Information

The Collaborative Convective Forecast Product (CCFP) facilitates strategic traffic flow planning by forecasting thunderstorm activity that may impact the NAS. It consists of 2, 4, and 6-hour forecasts of convection that will cover at least 25 percent of the area identified. Forecasts are prepared by the National Weather Service's Aviation Weather Center in collaboration with meteorologists from the airlines, the FAA's Center Weather Service Units, and National Business Aviation Association members. The area of coverage is the continental United States and coastal waters. In 2003, the coverage will be expanded to include portions of Ontario and Quebec, Canada. CCFP forecasts are available on several websites.

To facilitate route selection through weather-affected airspace, the FAA is exploring use of the prototype Corridor Integrated Weather System (CIWS) for near-term forecasts. The CIWS combines data from a number of radars to provide 0-to-2 hour forecasts on localized weather systems. This information will help the FAA to move airplanes through or around weather systems and quickly recapture airspace lost during thunderstorms.

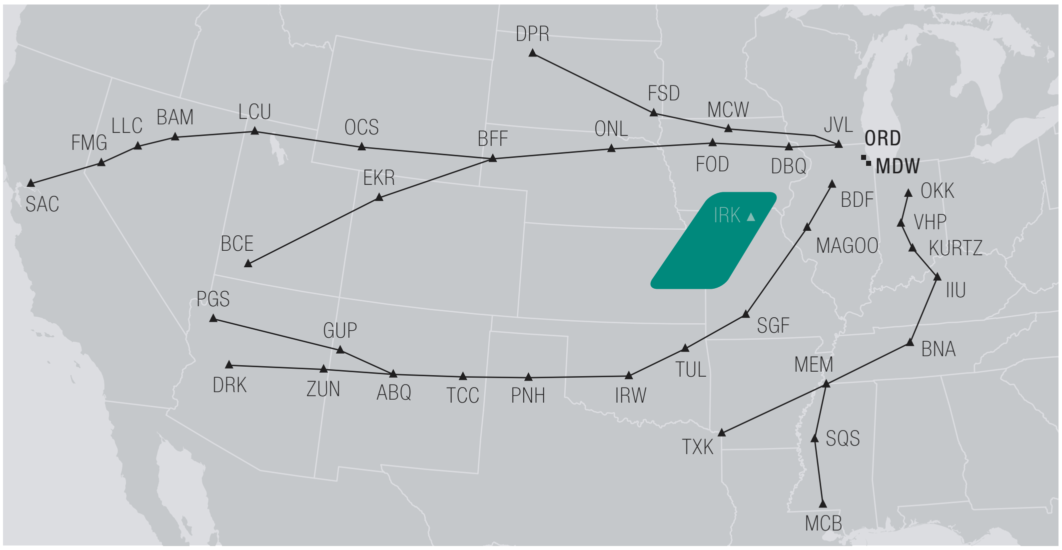
**Figure 5-2** CCFP Forecast Examples from the Aviation Weather Center Website




### 5.1.3 Route Coordination

The FAA and the airlines work together to develop alternatives to facilitate the efficient re-routing of traffic during severe weather and periods of congestion. The availability of pre-determined alternate routes provides flexibility in dealing with most severe weather events and expedites the route coordination process. It also allows airlines to plan ahead for possible route changes when severe weather is forecast. The Playbook contains textual and graphical displays of specific route alternatives for the most common scenarios that occur during severe weather seasons. The number of alternative routings available in the national Playbook has increased since the Spring/Summer initiative began, from 20 plays in 2000 to 114 plays in 2002. Airlines and controllers can use the Playbook to evaluate alternatives if a CCFP forecast indicates that a specific airway is likely to be blocked. Figure 5-3 shows a map of playbook routes available for flights into Chicago O'Hare when a weather system blocks one portion of an airway.

**Figure 5-3** Examples of Playbook Routes into Chicago




The FAA and airlines can also access a list of alternative routes called coded departure routes (CDRs) by querying a database called the Route Management Tool (RMT). The RMT facilitates information exchange between the FAA en route centers, the Command Center, and the airline user community, which mitigates potential adverse impacts to air traffic during periods of severe weather or congestion. Coded departure routes have eight character identifiers. The first three characters identify the departure airport, the second three the arrival airport, and the last two are unique route identifiers. For example, the database contains three CDR's for Atlanta to Miami, each corresponding to a different departure fix (Figure 5-4). The FAA plans to incorporate the Playbook routes into the Route Management Tool so that both playbook routes and CDR's can be accessed on one system.

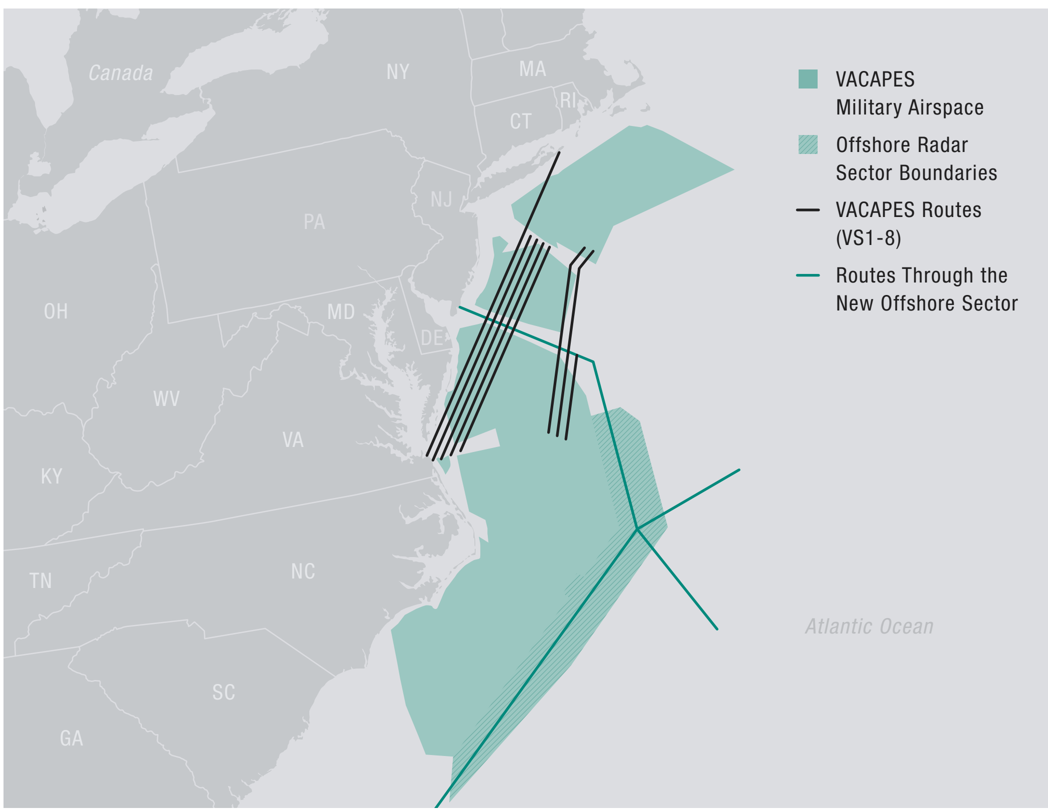
**Figure 5-4** Coded Departure Routes for Atlanta to Miami

| # | Route Code | Origin | Destination | Departure Fix | Route String | Departure ARTCC | Arrival ARTCC | Traversed ARTCCs |
|---|---|---|---|---|---|---|---|---|
| 1 | ATLMIA9E | KATL | KMIA | EATWO | KATL EATWO IRQ CRG OMN J79 VRB HEATT5 KMIA | ZTL | ZMA | ZJX ZMA ZTL |
| 2 | ATLMIA9W | KATL | KMIA | WEONE | KATL WEONE MGM SZW J43 PIE CYY3 KMIA | ZTL | ZMA | ZJX ZMA ZTL |
| 3 | ATLMIAPR | KATL | KMIA | SOONE | KATL SOONE J89 J75 RSW CYY3 KMIA | ZTL | ZMA | ZJX ZMA ZTL |

### 5.1.4 New Route Alternatives

In 2002, the FAA expanded the airspace available when standard routes are blocked by weather or congestion by offering six Canadian routes, two of which Canada has agreed to have available at all times. In addition, off the east coast of the U.S., flights now have access to two new off-shore routes through the Virginia Military Capes (VACAPES) airspace (for a total of eight) when it is not in use by the military. Use of the VACAPES requires coordination between the military, air traffic facilities and the Command Center. In 2001, the VACAPES routes were only available about 30 percent of the time. The recent addition of new oceanic radar sectors to the east of the VACAPES airspace provides additional alternative north-south routes. The radar coverage allows aircraft to fly closer to the military airspace due to the reduced separation standards applicable in a radar environment. Aircraft that want to use the new routes must be equipped to fly over the ocean. The offshore routes are longer than the overland routes, but flights save time in severe weather because flights between New York and Florida can be routed to the new sectors to avoid storms that otherwise delay take-off. Figure 5-5 shows a map of the VACAPES and the new offshore radar sectors.

**Figure 5-5** New East Coast Offshore Routing Alternatives




### 5.1.5 Collaborative Decision-Making

Collaborative Decision-Making (CDM) is a joint government/industry initiative aimed at improving air traffic management through increased information exchange among the various parties in the aviation community and improved automated decision support tools.

The program is one of five core technologies in the FAA's Free Flight program and includes participants from the FAA, air carrier industry, private industry, and academia. The FAA uses CDM to provide real-time information on weather, delays, cancellations and equipment to more than 30 airlines, business aviation, and major FAA air traffic control facilities.

Recent improvements to the Enhanced Traffic Management System (ETMS), the real-time operations system used by the FAA and airlines to manage traffic through the nation's airspace, have facilitated CDM. For example, ETMS now allows traffic managers to identify Flow Constrained Areas, where constraints such as volume or convective activity may require alternative traffic management initiatives such as re-routes or miles-in-trail restrictions. Early identification of these Flow Constrained Areas will allow traffic specialists to identify and evaluate where multiple flights are attempting to avoid the same storm. Airline dispatchers will use the information to assess which flights will need to be re-routed.

Flights destined for an airport where visibility is low are often held before they leave the ground, in order to avoid circling the airport when they arrive. A new version of ETMS contains information on changing airport weather conditions, known as Runway Visual Range (RVR) data, at 48 high-activity airports. Formerly, visibility data was only available directly from the traffic control tower at each airport. Now that this RVR data is available in real-time nationwide, airlines and the FAA are notified immediately that conditions at the destination airport are improving. The immediate availability of RVR data helps the airlines and FAA to quickly agree on ending ground delay programs and resuming regular service.

The new version of ETMS also includes a Simplified Substitution Process for airlines to request priority handling of certain flights. In earlier versions of ETMS, scheduling determinations were based primarily on the scheduled arrival time of each flight. Now, if a certain flight has many passengers who need to make connections or a crew near the end of its shift, the airline has a much simpler method to easily override the time-of-arrival list and give that flight a higher priority than others operated by the same carrier. This feature has special significance at hub airports, where it will help airlines to reduce the number of missed connections attributable to weather delays.

## 5.2 Area Navigation Procedures

The accuracy of modern aviation navigation systems and user requests for increased operational efficiency in terms of direct routings have resulted in the development of area navigation (RNAV) procedures for the en route, terminal, and approach phases of aircraft operations. RNAV is a method of navigation that permits aircraft operation on any desired flight path, without reference to ground-based navigation aids. Figure 5-6 is a conceptual illustration of the doglegs associated with routes determined by ground-based navigation aids versus a direct RNAV route. Aircraft equipped with a qualified flight management system (FMS), GPS, or DME/DME sensors can safely fly RNAV routes. RNAV operations provide a number of additional advantages over conventional navigation, including:

- Flexibility in permitting user-preferred routes that take advantage of optimal altitude and wind;
- Parallel routing to accommodate a greater flow of en route traffic;
- Establishment of bypass routes around high-density terminal areas and special use airspace;

➢ More efficient traffic patterns (i.e., between the en route, arrival, and final approach segments of the flight path);

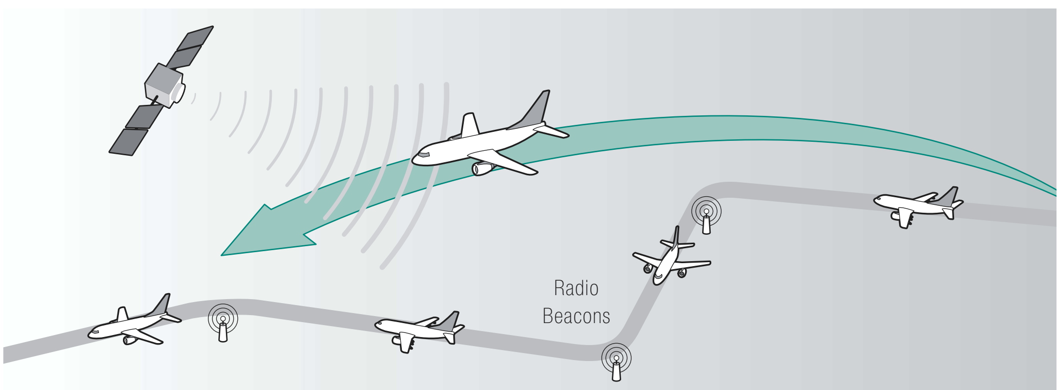
➢ Fewer voice transmissions between the pilot and controller to execute approaches;

➢ Smoother and safer descent paths on approach; and,

➢ Approaches to more airports in low-visibility conditions.

The concept of Required Navigational Performance (RNP), which defines levels of RNAV accuracy, is explained below, followed by a discussion of the FAA's development of RNAV approach procedures. More information on the implementation of RNAV concepts to enhance airspace capacity en route and in the arrival and departure phases of flight is provided in Chapter 6.

**Figure 5-6** Direct RNAV Routes vs. Routes Determined by Ground Based Navigation Aids




## 5.2.1 Required Navigational Performance

Required navigational performance (RNP) defines RNAV accuracy requirements for a variety of operations. For example, terminal RNP operations are defined as RNP-1 meaning that the aircraft's navigation system must be able to maintain a total error of plus-or-minus one nautical mile 95 percent of the time. RNP specifies the performance requirements for the aircraft, but does not require that an aircraft be equipped with a specific navigation sensor. Figure 5-7 shows examples of RNP-based RNAV operations, and how they may be applied.

**Figure 5-7** Examples of RNP Applications

| Operation | RNP Type | Example Application |
|---|---|---|
| Oceanic/Remote | RNP-10 | 50 NM Separation |
| Oceanic/Remote | RNP-4 | 30/30 NM Separation |
| En Route Domestic | RNP-2 RNAV | 8 NM Route Spacing |
| Terminal Area | RNP-1 RNAV | 4 NM Spacing |
| Approach | RNP-0.3 RNAV | LNAV (Non-Precision Approach) |
| Approach | RNP-0.3 RNAV | LNAV/VNAV (Approach Procedure with Vertical Guidance) |

**Note:** These are examples of how RNP may be applied. Other types of operations may also be developed and applied.

**Source:** FAA Advisory Circular No. 20-RNP

In July 2002, the FAA issued a policy statement explaining the benefits of RNP and committing the FAA to developing a plan to establish public RNP airspace and procedures in U.S. domestic airspace by July 2003. In August 2002, the FAA issued an advisory circular that establishes the standards for RNP approaches and landings.[8]

RNP concepts have been implemented within the airspace of several countries, as well as some areas of oceanic airspace (see Reduced Oceanic Horizontal Separation Minima in this chapter). Currently, use of RNP by United States operators is limited to international operations in RNP airspace, and domestic special procedures commissioned by particular airlines. Alaska Airlines flies an RNP RNAV approach to Juneau and six other Alaskan Airports, allowing flights to land or take-off under weather conditions that would have required flights to be delayed or rerouted in the past. Aircraft flying the approach have unique equipage requirements, such as dual GPS receivers, inertial navigation systems coupled to a flight director or autopilot, and use of a color weather radar display in ground-mapping mode.

### 5.2.2 Area Navigation Approaches

RNAV approaches increase airport throughput by allowing airplanes to safely navigate landings in sub-optimal weather conditions. The development of RNAV approaches contributes to opening smaller airports to larger volumes of air traffic, which may alleviate some of the pressure on large, busy airports. RNAV approach charts can currently contain up to four approaches with differing minima. They are the LNAV (lateral navigation), LNAV/VNAV (lateral navigation/vertical navigation), LPV (localizer performance with vertical guidance), and circling.

The LNAV approach is a non-precision approach that can be conducted with approach-certified GPS receivers. As of April 2002, the FAA had published 2,884 LNAV approaches at general aviation airports, of which 37 percent are at airports with no vertically-guided instrument approaches and no previous straight-in instrument approach capability.

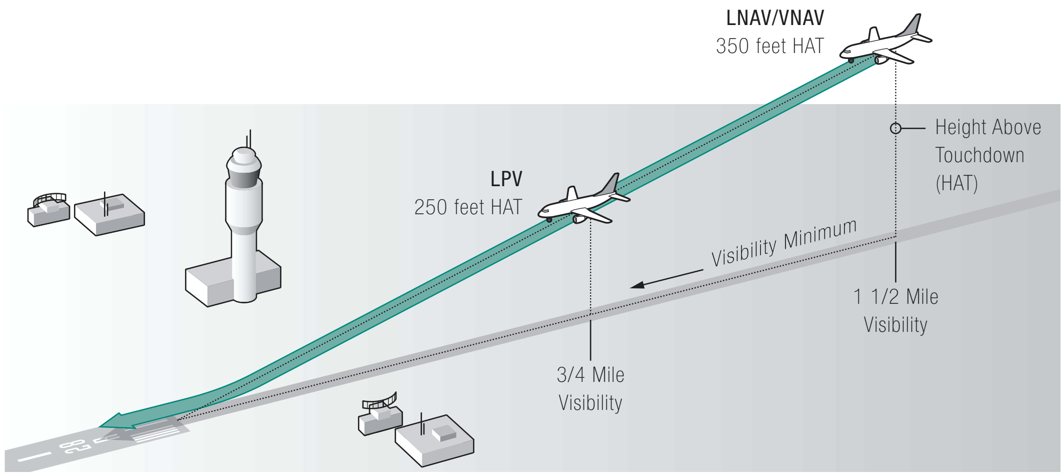
The LNAV/VNAV procedure is an approach procedure with vertical guidance that falls between a conventional non-precision approach and a true precision approach. LNAV/VNAV approaches have the lateral accuracy associated with non-precision approaches, but also have a stable, guided vertical path that leads to the runway aim point. They allow a more stable and reliable descent path than traditional non-precision instrument approaches. LNAV/VNAV approaches typically have a decision altitude of 350 feet or higher above the runway touchdown point, and require the aircraft to be equipped with an approved barometric-VNAV system or a Wide Area Augmentation System (WAAS) certified receiver. The FAA has published approximately 350 LNAV/VNAV procedures, and expects to have 700 LNAV/VNAV procedures available when WAAS is commissioned in 2003. Certified WAAS receivers are expected to become available in 2003.

LPV approaches will use WAAS to open up more runways to 250-foot ceiling and three-quarter mile visibility minimums (Figure 5-8). The LPV approach provides lateral guidance that is equivalent to or better than an instrument landing system (ILS) localizer, and vertical guidance that is only slightly less accurate than an ILS. The FAA expects to

8 AC 120-29A Criteria for Approval of Category I and Category II Weather Minima for Approach.

publish its first LPV procedures in September 2003, and an additional 300 LPV approaches per year thereafter. An important benefit of LPV will be bringing vertically-guided instrument procedures to several thousand runways that would normally not have an instrument approach, many which serve general aviation users. LPV approaches will attain 250 feet and 3/4 mile visibility at approximately 80% of the runways in the NAS, while LNAV/VNAV reach the same minima at only 20 percent of the runways.[9]

**Figure 5-8** Typical Decision Altitude and Visibility Minimums for LNAV/VNAV and LPV Approaches




Since the inception of GPS, the number of RNAV approach procedures has increased steadily. By the end of FY 2002, 3,584 RNAV approaches had been developed and published—up from 44 in 1995 (Figure 5-9). The FAA plans to develop and publish between 700 and 800 RNAV approaches (LNAV, LNAV/VNAV, and LPV combined) per year through FY 2007. The FAA projects that by 2007 all public use paved runways will have RNAV approaches. A national RNAV development prioritization can be found at the following FAA website (http://avn.faa.gov/index.asp?xml=nfpo/production). The procedure development schedule can be searched by fiscal year (2001-2006) or by region.

**Figure 5-9** RNAV Approaches Published in the U.S. (1995-2001)

| Fiscal Year | New RNAV Approaches | Cumulative RNAV Approaches |
|---|---|---|
| 1995 | 44 | 44 |
| 1996 | 339 | 383 |
| 1997 | 585 | 968 |
| 1998 | 516 | 1,484 |
| 1999 | 531 | 2,015 |
| 2000 | 504 | 2,519 |
| 2001 | 447 | 2,966 |
| 2002 | 618 | 3,584 |

9 *Navigation and Landing Transition Strategy*, FAA, August 2002.

## 5.3 Reduced Separation Minima

Separation standards, also referred to as separation minima, are being reduced incrementally in various regions to take advantage of technological advances that improve the accuracy and timeliness of position information available to pilots and air traffic controllers. Vertical and horizontal separation minima have been already been reduced in large portions of oceanic airspace, and the reduction of vertical separation minima for U.S. domestic airspace is in the planning stages.

### 5.3.1 Reduced Vertical Separation Minima

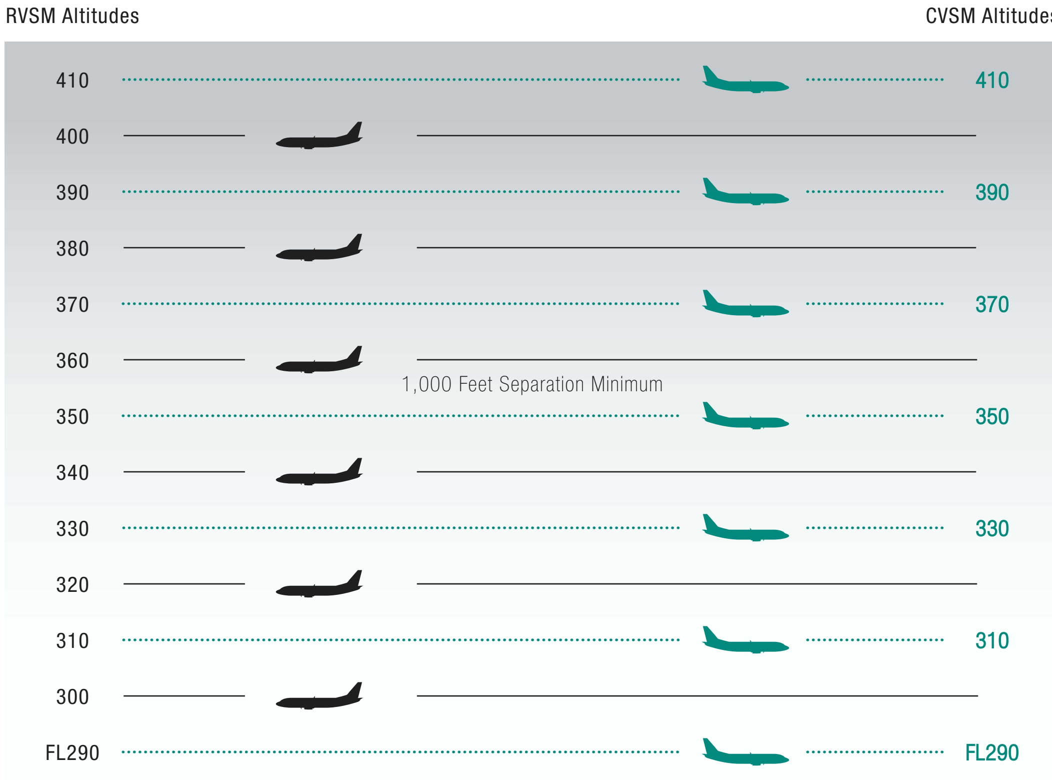
Procedures implemented more than 40 years ago required a 2,000-foot minimum vertical separation between IFR aircraft operating above Flight Level[10] (FL) 290, but only 1,000-foot separation below FL290. The 2,000-foot separation above FL290 was necessary because the instruments used to measure aircraft altitude at that time had relatively poor accuracy at higher altitudes. The 2,000-foot minimum vertical separation restricts the flight levels available at FL290 and above to six. During peak periods these flight levels can become congested. Over the past several years, the U.S. and other nations, in cooperation with the International Civil Aviation Organization (ICAO) and international air carriers, have reduced vertical separation minima from 2,000 feet to 1,000 feet in selected airspace.

The goal of this initiative, called Reduced Vertical Separation Minima (RVSM) is to increase airspace capacity and to allow more aircraft to operate at fuel-efficient altitudes. Implementation of RVSM makes six additional flight levels available (Figure 5-10). In the RVSM environment, aircraft are more likely to receive their requested altitude and route, because more aircraft can be accommodated on the most time- and fuel-efficient tracks or routes available. RVSM also gives air traffic controllers greater flexibility in re-routing traffic around storms, and enabling aircraft to cross-intersecting flight paths above or below conflicting traffic.

To ensure that aircraft will be able to maintain separation, aircraft that want to participate in RVSM must meet stringent altimetry system standards. Aircraft that are approved for RVSM are eligible to conduct RVSM operations worldwide. Approximately 22 percent of flights in U.S. airspace are already conducted by aircraft that have been approved for RVSM operations.

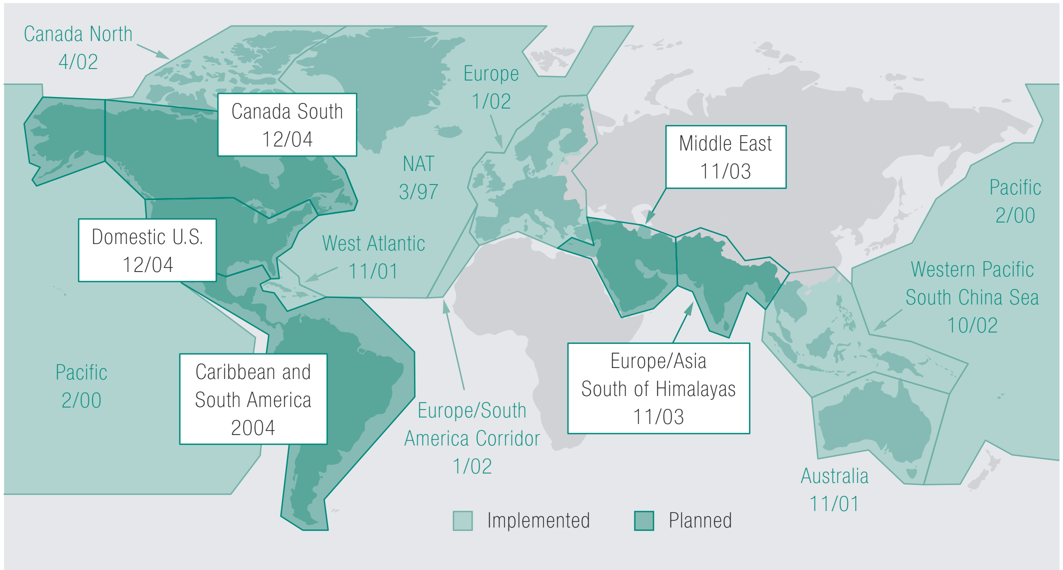
10 Flight Level is a level of constant atmospheric pressure stated in three digits that represent altitude in hundreds of feet. For example, Flight Level 250 represents a barometric altimeter indicator of 25,000 feet.

**Figure 5-10** Reduced Vertical Separation Minima to 1,000 Feet




RVSM is being phased in by altitude and airspace region. It has been implemented in oceanic airspace in the North and South Atlantic, the Pacific, the South China Sea, and in the portion of the West Atlantic Route System (WATRS) that is in the New York Oceanic Flight Information Region (FIR). Since RVSM is in its early stages in many of these areas, benefits can only be estimated. In the North Atlantic airspace, introduction of RVSM resulted in elimination of 50 percent of the fuel penalty attributed to inefficient track design and cruise level, and traffic congestion. The implementation of RVSM worldwide is illustrated in Figure 5-11.

**Figure 5-11** RVSM Implemented and Planned




## 5.3.2 U.S. Domestic Reduced Vertical Separation Minima

In May, 2002 the FAA issued a notice of proposed rulemaking that would implement RVSM in domestic U.S. airspace in December 2004. The new separation standards would apply to the 48 contiguous states, Alaska, and portions of the Gulf of Mexico, from FL 290–410 inclusive.

FAA data indicate that about 13,500 planes now operate between FL290 and FL410. So far, about 3,600 planes, including 1,600 airliners, are RVSM-certified. Under the proposed rules, aircraft that are not RVSM-certified will be able to transition through but not cruise in U.S. DRVSM airspace. Airplanes that are not yet RVSM-certified when DRVSM goes into effect will be handled at lower or higher altitudes. The FAA forecasts that DRVSM will save operators $5.8 billion in fuel costs over 15 years, including $371 million in the first year of the program.

The comment period for the U.S. DRVSM rule expired on August 8, 2002. The airline industry reiterated support for DRVSM, but operators and manufacturers of small jets say the rule would impose unacceptable aircraft modification costs, and to minimize its impact, it should be phased in gradually. The Air Transportation Association (ATA) noted in its comments that domestic U.S. airspace will be the “last large block of dense-traffic airspace” to receive RVSM benefits. RVSM has already been implemented in the continental airspace of Australia and Europe, and northern Canada. Canada is planning to implement RVSM in southern Canadian airspace at the same time that it is implemented domestically in the U.S. ATA agreed that a single-phase conversion, as was done in Europe, is the best way to implement, but suggested that the conversion date be postponed until January 2005, after the holiday peak in air traffic. Charter operators reiterated concerns about the equipage costs. One noted that the retrofit would create serious and unacceptable financial and operational hardship. Without the new equipment, they would have to fly below level 290, resulting in higher fuel burn and more financial consequences. The final rule on domestic RVSM implementation will be published in June 2003.

### 5.3.3 Reduced Oceanic Horizontal Separation Minima

The current oceanic air traffic control system uses filed flight plans and position reports to track an aircraft's progress and ensure that separation is maintained. Position reports, sent by pilots over high frequency radio through a private radio service that relays the messages to the air traffic control system, are infrequent (approximately one per hour). Radio communication is subject to interference, disruption, and delay because radio operators are required to relay messages between pilots and controllers. These deficiencies in communications and surveillance have necessitated larger horizontal separation minima for aircraft flying over the ocean out of radar range. But with the improved navigational capabilities made possible by technologies such as the global positioning system (GPS) and controller pilot data link communications, both lateral and longitudinal oceanic horizontal separation standards are being reduced.

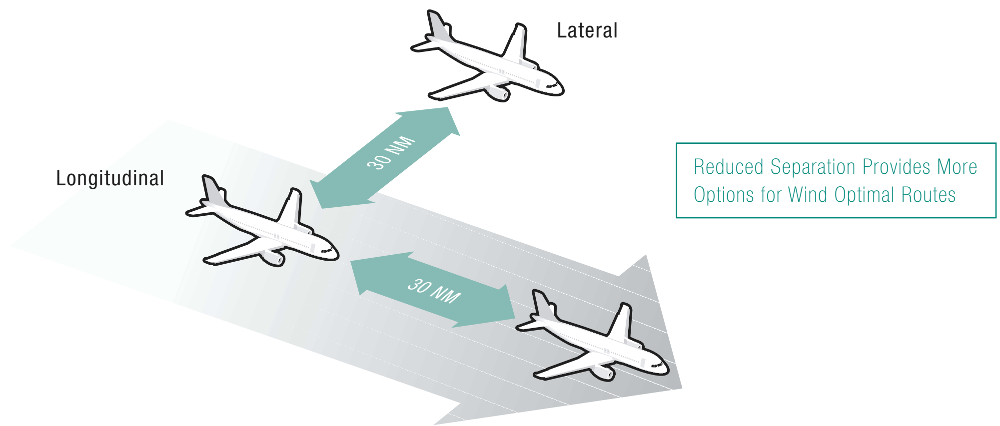
Allowing properly equipped aircraft to operate at reduced oceanic separation will enable more aircraft to fly optimal routes, reducing the time required for the oceanic leg of the flight. Reduced separation laterally may provide space for additional routes to current destinations or new direct markets. Reduced longitudinal (nose-to-tail) separation will provide more opportunity to add flights without a delay or speed penalty.

Oceanic lateral separation standards were reduced from 100 to 50 nautical miles in the Northern and Central Pacific regions in 1998 and in the Central East Pacific in 2000 (for aircraft that are RNP-10 approved). The FAA plans to extend the 50 nautical mile separation standard to the South Pacific. Because flights along the South Pacific routes are frequently in excess of 15 hours, the fuel and time-savings resulting from more aircraft flying closer to the ideal wind route in this region are expected to be substantial.

In addition, there are plans to reduce oceanic lateral and longitudinal separation minima to 30 nautical miles in portions of the South Pacific airspace by 2005 (accelerated from the initial plan for 2006) (Figure 5-12). These reduced separation minima will only apply to aircraft with sufficiently accurate navigation equipment (RNP-4),[11] controller to pilot data link communication, and enhanced surveillance capabilities provided by automatic dependent surveillance.

11 RNP-4 approved aircraft are equipped with navigation systems that can navigate within 4 miles of desired position with 95% probability.

**Figure 5-12** Reduced Oceanic Lateral and Longitudinal Separation Minima (Proposed)




## 5.4 Increasing Civilian Access to Special Use Airspace

The FAA routinely works with the Department of Defense (DoD) to provide civilian access to special use airspace (SUA) when it is not being used by the military, through agreements concerning civilian access to specific SUA and the development of automated information systems that report on the availability of SUA. Since September 11, 2001, both agencies have increased their efforts to ensure efficient coordination because of the increased number of military operations. More frequent military involvement, especially near large metropolitan areas, adds an additional, unpredictable congestion factor. The FAA and the military have continued to improve their communications systems to facilitate civilian use of SUA when it is not being used by the military. These coordination activities include the following:

- At the Palatka Complex in Florida, Restricted Area-2906 was scheduled for general aviation access 24 hours per week in early 2001. Based on its initial success, weekend hours of access were expanded.

- In Florida, the Jacksonville Center and the Navy Fleet Area Control and Surveillance Facility have initiated an airspace coordination process using a flight-planning tool developed by the Air Force. Using the software, either facility can depict airspace and transmit the data to the other. This enhances the flow of civilian traffic with a minimal impact on Navy flight operations.

- In cooperation with DoD, the FAA has developed a computer information system, the Special Use Airspace Management System (SAMS) to provide pilots, airlines, and controllers with the latest status information, current and scheduled, on special use airspace. DoD operates the Military Airspace Management System (MAMS), which gathers information about SUA scheduling and transmits this data to SAMS. These two systems, working in concert, ensure that the FAA and system users have access to daily information on SUA availability on the internet. A prototype system called Special Use Airspace/In-Flight Service Enhancement would be used to disseminate graphic depictions of near-real time SUA information to airlines and GA users.

➢ The FAA has begun to include VFR waypoints on sectional and terminal charts, which can be used to help VFR pilots navigate around special use airspace. The waypoints help pilots using GPS for supplemental navigation by allowing them to fly from point-to-point and navigate around special use airspace and other restricted or congested airspace.

## 5.5 Approaches to Closely-Spaced Parallel Runways

At airports with closely-spaced parallel runways, capacity is constrained in low-visibility conditions. When visibility is good pilots can conduct simultaneous visual approaches to closely-spaced parallel runways. But during periods of low visibility, simultaneous approaches to closely-spaced parallel runways monitored by conventional airport surveillance radar are not permitted. For parallel runways separated by 2,500 feet to 4,300 feet, two arrival streams can be maintained but operations are limited to parallel dependent instrument approaches using 1.5 mile staggered separation. For parallel runways spaced less than 2,500 feet apart, operations are restricted to one arrival stream, which effectively reduces the airport's arrival capacity to one-half of its capacity in visual meteorological conditions. To help reduce the negative effect of weather on arrival capacity, the FAA has developed several approach procedures that take advantage of the enhanced surveillance capability of the precision runway monitor (PRM).

### 5.5.1 Precision Runway Monitor

The PRM is a surveillance radar that updates essential aircraft target information 4 to 5 times more often than conventional radar equipment. PRM also predicts the aircraft track and provides aural and visual alarms when an aircraft is within ten seconds of penetrating the non-transgression zone. During PRM approaches to closely-spaced parallel runways, a separate controller monitors each runway. Use of the PRM allows air traffic controllers to ensure safe separation of aircraft on the parallel approach courses and maintain an efficient rate of aircraft landings during adverse weather conditions. All pilots must complete special training before they are authorized to conduct a simultaneous ILS PRM approach to closely-spaced parallel runways.

In December 2001, the FAA determined that the Traffic Alert and Collision Avoidance System (TCAS) may be operated in the resolution advisory (RA) mode when conducting a PRM approach. Previously, the FAA had required pilots to turn off the TCAS RA during a PRM approach to avoid the possibility of conflict between the RA and an air traffic controller's instruction. In the rare event of a simultaneous TCAS RA and controller breakout instruction, the pilot should immediately respond to the RA and comply with the turn portion of the ATC breakout instruction. If following a RA requires deviating from an ATC clearance, the pilot should advise ATC as soon as possible.

The FAA has commissioned PRMs at Minneapolis and St. Louis, and most recently, at Philadelphia International Airport in September 2001. PRM's are scheduled for commissioning at San Francisco and John F. Kennedy in late-2002, Cleveland in late-2004, and Atlanta in 2006, coincident with the completion of the fifth parallel runway. The FAA has approved the following procedures using a PRM to allow simultaneous instrument approaches in adverse weather.

- ➢ Simultaneous instrument approaches for 4,300 feet-3,400 feet spacing (applicable to Minneapolis).
- ➢ Simultaneous instrument approaches down to 3,000 feet spacing with one instrument landing system (ILS) localizer offset by 2.5-3 degrees (Philadelphia and proposed for JFK).
- ➢ Simultaneous offset instrument approaches (SOIA) for parallel runways spaced at least 750 feet apart, and less than 3,000 feet apart at airports identified by the FAA (proposed for SFO).

In June 2002, Philadelphia began using its PRM to conduct simultaneous approaches to its parallel runways spaced 3,000 feet apart. Air traffic controllers can use this procedure to direct slower moving aircraft to the north runway, and the faster jets to the south parallel runway. The SOIA procedure, which has been developed but not yet implemented, is discussed in more detail in the following section.

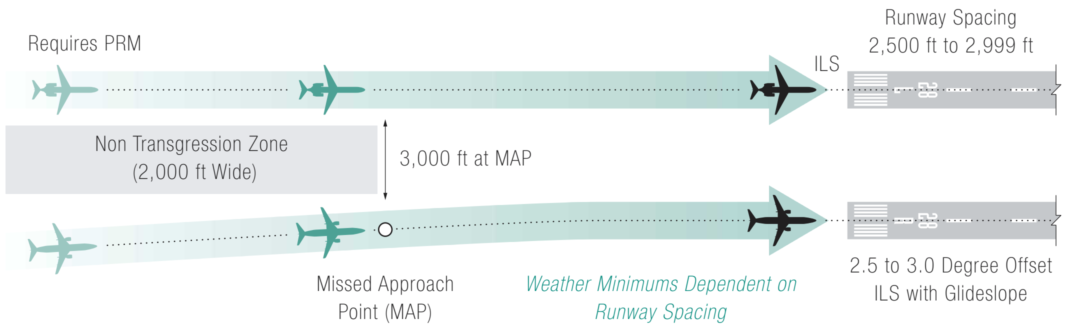
### 5.5.2 Simultaneous Offset Instrument Approaches

The SOIA procedure would allow simultaneous approaches to parallel runways spaced from 750 feet to 3,000 feet apart. It requires the use of a PRM, a straight-in ILS approach to one runway, and an offset localizer directional aid (LDA) with glide slope approach to the other runway (Figure 5-13).

The SOIA concept involves the pairing of aircraft along adjacent approach courses separated by at least 3,000 feet with a designated missed approach point approximately 3.5 nautical miles from the runway threshold. The pilot on the offset approach would fly a straight-but-angled approach until descending below the cloud cover. At that point, the pilot would have a period of time to visually acquire the traffic on the other approach before continuing to the runway. If the pilot does not see the other aircraft before reaching the missed approach point, the approach would be discontinued.

San Francisco International Airport (SFO) and Lambert-St. Louis International Airport (STL) are the first candidate airports for SOIA. At SFO the arrival rate is 60 aircraft per hour in clear weather using both parallel runways, which are 750 feet apart. In times of heavy fog and low-ceiling conditions, aircraft are placed in-trail to one runway, reducing the airport arrival rate by half. The SOIA procedure will enable SFO to maintain an arrival rate of up to 40 aircraft per hour with a cloud base as low as 1,600 feet and four miles visibility. The FAA has completed flyability, collision risk, and preliminary wake turbulence analyses for the SOIA procedure, but the PRM has not yet been commissioned. At STL, the parallel runways are approximately 1,300 feet apart. PRM-SOIA procedures are expected to be operational in 2003 for both sites. Other potential sites for SOIA include Newark, Cleveland, and Miami airports.

**Figure 5-13** Simultaneous Offset Instrument Approach




### 5.5.3 Along Track Separation

Along track separation is a proposal to increase arrivals to parallel runways spaced less than 2,500 ft. apart in periods of low visibility. The procedure entails parallel dependent instrument approaches staggered down to 1.5 nautical miles diagonally (Figure 5-14). The relevant safety analyses have not yet been conducted to determine whether a PRM would be required for this procedure to ensure safe separation.

**Figure 5-14** Along Track Separation